

Ecosystem-based Adaptation: Potential, Effectiveness and Knowledge Gaps

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Emilia Pramova⁽¹⁾, Bruno Locatelli^(1,2), Houria Djoudi⁽¹⁾, Olufunso Somorin⁽³⁾

(1) CIFOR Indonesia, (2) CIRAD France, (3) CIFOR Cameroon

Ecosystem-based Adaptation

- The use of ecosystem services for the adaptation of **people** to climate change (CBD 2009).
- Sustainable management, conservation, and restoration of ecosystems **for the provision of services**.
- Can balance needs for immediate benefits while preparing for future hazards.
- 'No-regret' measures: multiple socio-ecological gains.
- Advocated mainly by international NGOs, organizations and bodies & think tanks.
- Scientifically substantiated?

How is EbA Addressed in Science?

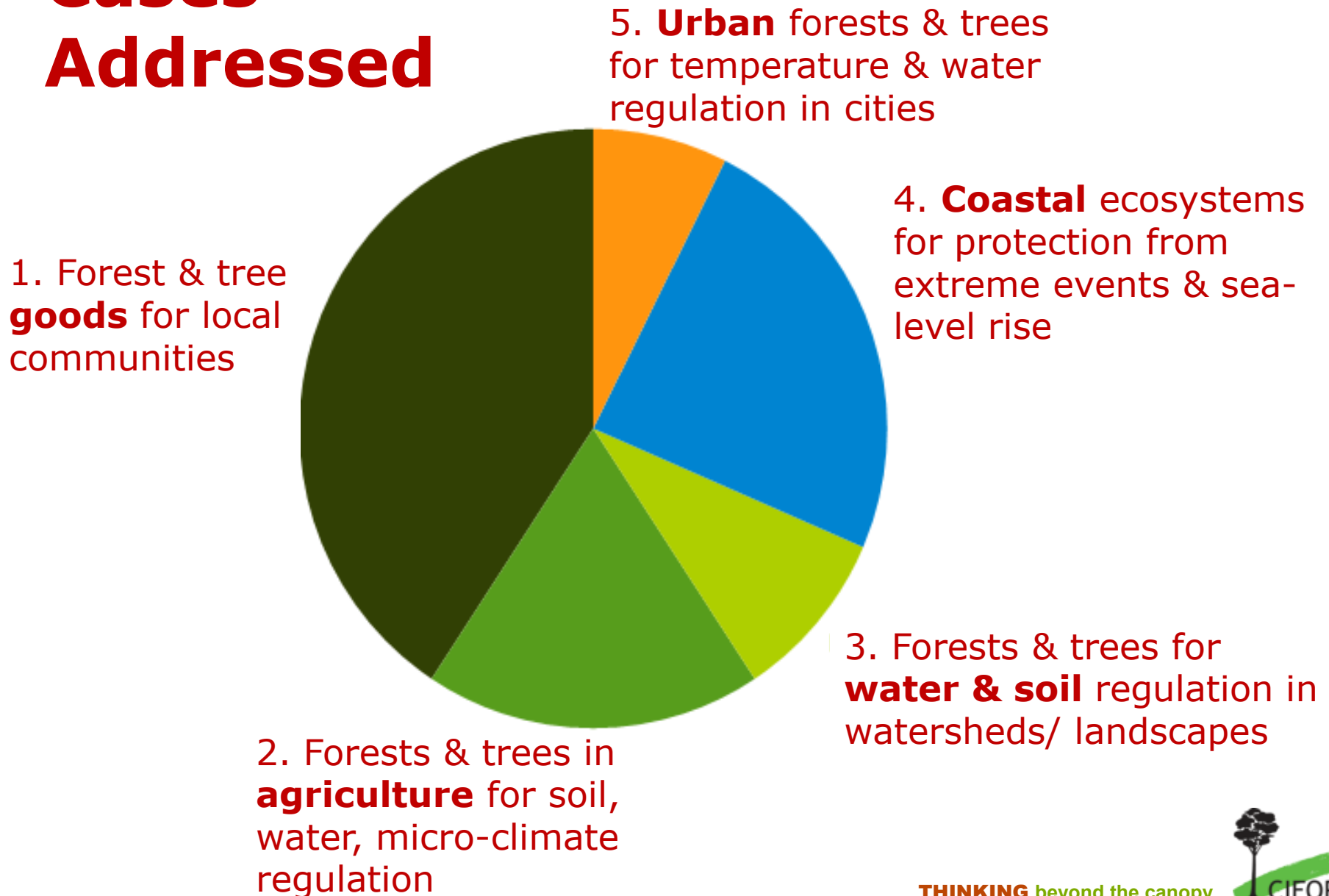
Objective:

- Analyze peer-reviewed articles discussing the links between ecosystems and social vulnerability or adaptation to climate variability and change.

Methodology:

- Search in Scopus with pre-defined keywords.
- From 3,013 articles, 41 selected linking ecosystem services, people and climate hazards in specific locations.

Cases Addressed



1. Forest & Tree Goods for Local Communities

For Coping

- **Safety nets** during drought in Africa: timber, fuelwood, fodder, NTFPs etc. from forests & agroforestry (e.g. Paavola, 2009)

High dependency on forest goods when harvests fail or assets are lost (e.g. Fisher et al. 2010).

- Forests for **post-disaster insurance** in South America (2): timber, NTFPs (e.g. McSweeney, 2005)

For Adapting

- Mangrove and **livelihoods** in Asia: fish, fuelwood, timber, honey, etc. (e.g. Adger et al. 1997)

Access to forest resources critical for food security, livelihoods & well-being under CC (e.g. Owuor et al., 2005) and determines **vulnerability** to climate threats (e.g. Kelly & Adger, 2000).



1. Forest & Tree Goods for Local Communities

Evidence

- Generally well substantiated (social field surveys).

Recommendations/ solutions

- Sustainable management with **secure access**. Flexibility for emergency extraction.
- **Participatory** decision-making & collaborative mgmt.
- **Incentives**: insurance-based & markets.
- CC in national **policies** & institutional networks.

Trade-offs/ Uncertainties

- Role of **markets** for adaptation under different institutional arrangements.
- Household **responses** under different shocks.



2. Forests & Trees in Agriculture for Soil, Water, Micro-climate Regulation

Studies

- **Agroforestry** systems for climate-resilient agriculture (e.g. Garrity et al. 2010).
- Local **shade** cover, soil **fertility & moisture**, wind breaks, water **infiltration** etc.

Evidence

- Biophysical field measurements (e.g. Lin, 2010)
- Social field surveys, meta-analysis (e.g. Sawadogo, 2011).

Recommendations / Solutions

- Awareness raising, extension services
- Bottom-up approaches & enhancement of social capacity.

Trade-offs/ Uncertainties

- Short term production vs. long term gains & adaptation.



3. Forests & Trees for Water & Soil Regulation in Watersheds/ Landscapes

Studies

- Role of forests for protecting watersheds and **securing water flows** under drought (e.g. Robledo et. al. 2004).
- Soil protection and links between deforestation & **flood/ landslide** disasters (e.g. Gaillard et al., 2007).

Evidence

- Only 1 article with evidence. Economic valuation based on hydrological modeling (Pattanayak & Kramer, 2001).

Recommendations/ Solutions

- Landscape approach to land-use policies

Trade-offs/ Uncertainties

- Forests = possible competition for water in dry areas.
- Relationship between watershed protection & base flow



4. Coastal Ecosystems for Protection from Extreme Events & Sea-level rise

Studies

- Mostly mangroves for protection against cyclones & storms in Asia (e.g. Das & Vincent, 2009).
- Protection against sea-level rise with mangroves (South America), forests (Africa) and salt marshes & mudflats (Europe, North America) (e.g. Turner et al. 2006).

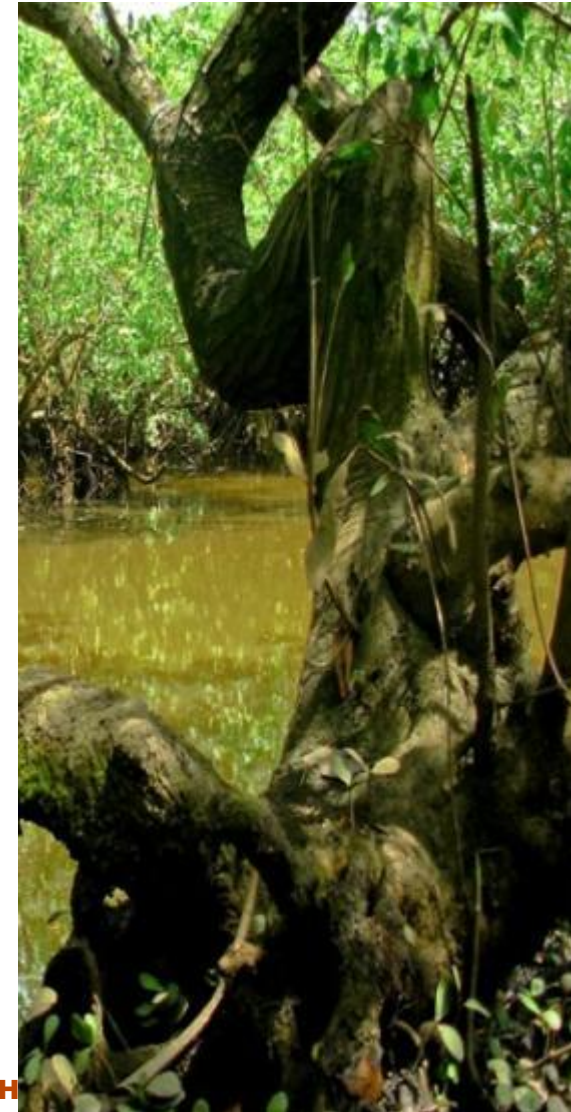
Evidence

- Substantial for protection against cyclones and hurricanes: model of **disaster impacts & vegetation**, economic valuation (e.g. Constanza et al. 2008).
- No substantial evidence for sea-level rise.

Recommendations/ Solutions

- **Adaptive** coastal management & land-use planning
- **Precautionary** principle for protection/conservation.

Trade-offs/ Uncertainties



5. Urban Forests & Trees for Temperature & Water Regulation in Cities

Studies

- In Europe & North America: urban trees very effective in reducing temperatures (e.g. Gill et al. 2007).
- In South America, role of land-use in urban flood risk (Ebert et al. 2010).

Evidence

- Modeling

Recommendations/ Solutions

- Integrate values of urban trees in land-use planning.

Trade-offs/ Uncertainties

- Water resources for maintaining urban trees vs. other uses in times of drought.



Conclusions

What we know

- Ecosystems can play a role in reducing social vulnerability to climate variability and change, through both immediate and long-term benefits.
- Role of provisioning services substantiated. The subsistence and land insecure people are highly dependent on ecosystem goods as safety nets.
- Role of regulating services not enough substantiated. Some evidence on mangroves and agroforestry.
- Specific institutional arrangements needed to ensure ecosystem benefits for adaptation.

What we still don't know

- Thresholds within which EbA is an effective and efficient approach. Precise biophysical factors for most regulating services.
- Value of regulating forest ecosystem services for adaptation in different contexts.
- Cumulative effects on ecosystems, ecosystem services and the potential winners & losers.

Thank you!
Terima kasih!

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THINKING beyond the canopy

